

A Pattern Puzzle

by – Winnie Miller and JoLeigh Honey

Activity overview

Students will analyze patterns and represent them using tiles, tables, graphs and equations. The activity will include a warm up, a problem solving task, and an extension.

Concepts

Students make strategic choices of procedures to solve linear equations in one variable and implement them efficiently, understanding that when they use the properties of equality to express an equation in a new way, solutions that they obtain for the new equation also solve the original equation.

Teacher preparation

Have tiles and graph paper available. Make a copy of the Warm Up, Problem Solving Task and Extension.

Classroom management tips

Have students work in groups. Assign groups to describe patterns found in words, numerically in a table, algebraically as an expression and graphically sketching on graph paper as well as the handheld.

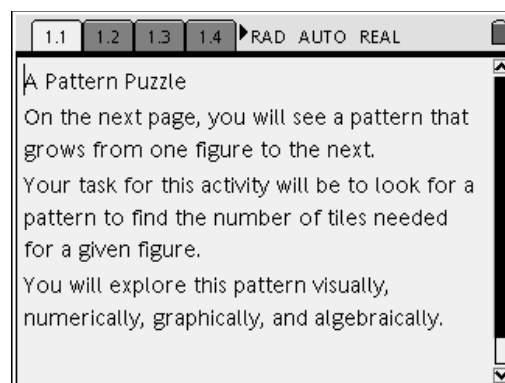
TI-Nspire Applications

Graphs and Geometry, Notes

Step-by-step directions

Step by Step Directions:

Open the file A_Pattern_Puzzle.tns on your handheld and work with a small group to complete the activity. Use this document as a reference to record your answers.

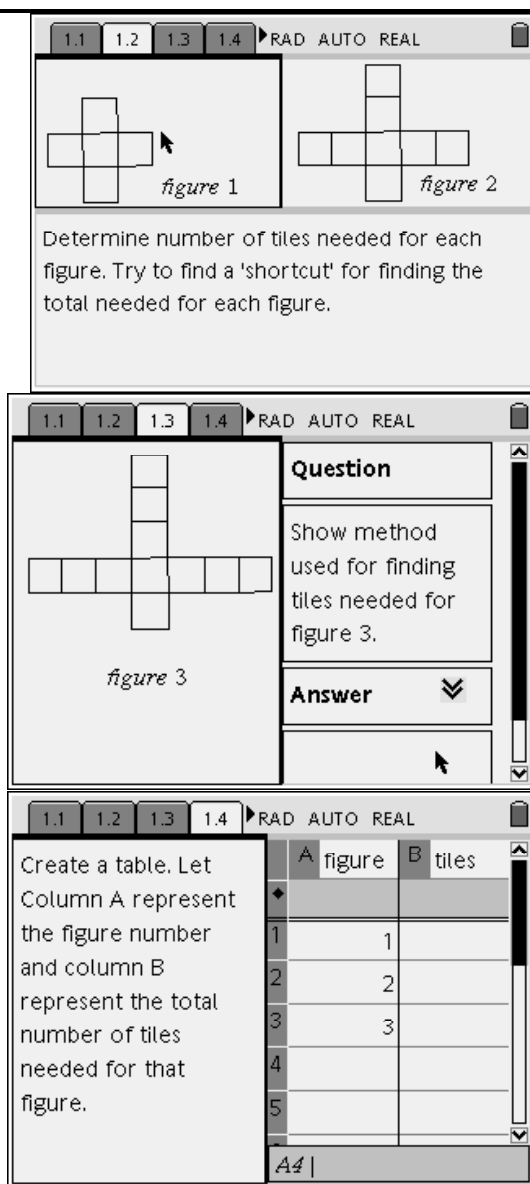


Task:

Determine the number of tiles needed for each figure. Find a "shortcut" for finding the total needed for each figure.

Show a method used for finding tiles used for finding tiles needed for figure 3.

Create a table.



The TI-Nspire interface displays three figures made of tiles. Figure 1 is a cross shape with 5 tiles. Figure 2 is a cross shape with 10 tiles. Figure 3 is a cross shape with 17 tiles. The interface also shows a table with columns A (figure) and B (tiles).

A	figure	B	tiles
1	1		
2	2		
3	3		
4			
5			

A Puzzle Pattern

by: Winnie Miller and JoLeigh Honey Grade

level: middle school

Subject: Middle School Math

Time required: 60 minutes

Materials: TI-Nspire

Determine the number of tiles needed for the 5th, 10th and 15th figures

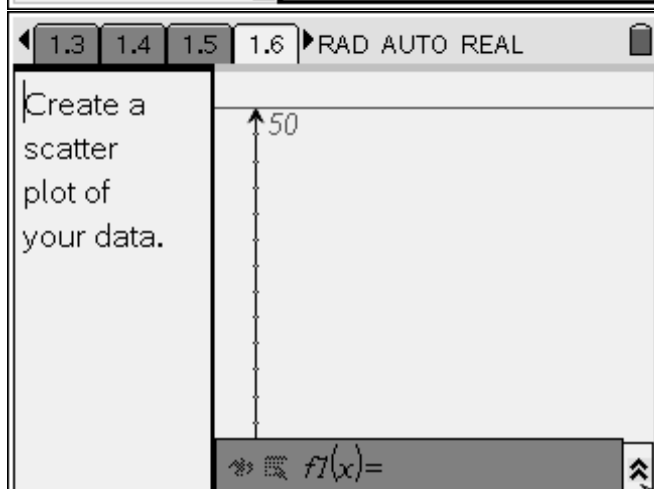
1.2 1.3 1.4 1.5 RAD AUTO REAL

Determine number of tiles needed for the 5th, 10th, and 15th figures. Add values to table. Show method for all figures in column C.

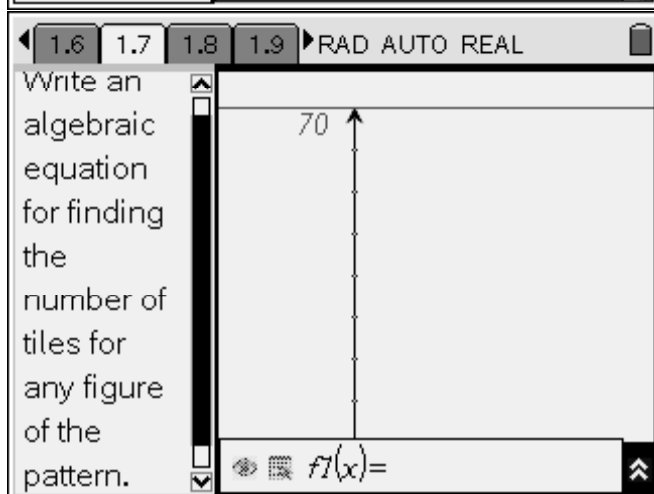
f...	B t...	C method
2	2	
3	3	
4	5	
5	10	
6	15	

C6 |

Create a scatter plot.



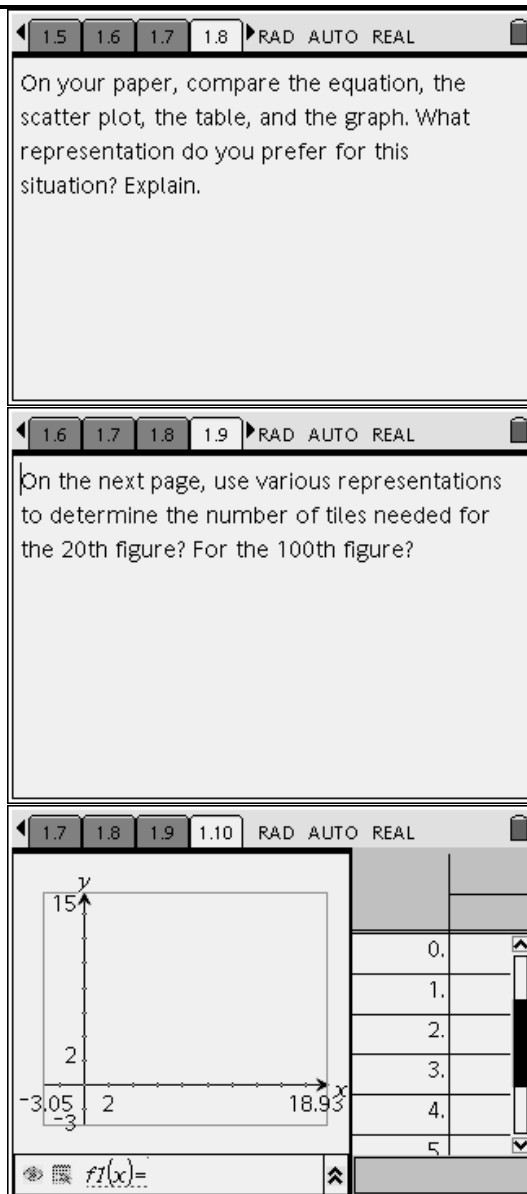
Write an algebraic equation.



Compare the different representations.
How are the equation, the scatter plot, the table
and the graph similar?

Use representations to determine the number of
tiles needed for the 20th figure?

for the 100th figure?



Assessment and evaluation

- Suggestions: After some private think time, allow students to share their method with a partner. As students share their methods, look for different ways of “seeing” the pattern. Call on students whose strategies lead to generalizations showing how they saw the pattern.
- Facilitate a whole class discussion of the solution methods and solutions.
- Allow time for students to revise their own work if needed.
- *Answers to student questions in the Student TI-Nspire document and/or student worksheet*

A Puzzle Pattern

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Grade level: middle school

Subject: mathematics

Time required: 60 minutes

Materials: TI-Nspire

1.1 1.2 1.3 1.4 RAD AUTO REAL

Create a table.
Let Column A represent the figure number and column B represent the total number of tiles needed for that figure.

A figure	B tiles	C
1	1	5
2	2	8
3	3	11
4		
5		
6		

B4 |

1.2 1.3 1.4 1.5 RAD AUTO REAL

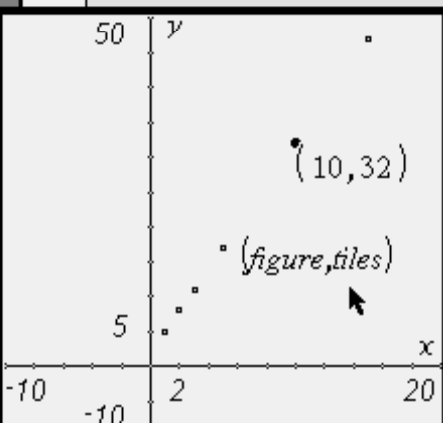
Determine number of tiles needed for the 5th, 10th, and 15th figures. Add values to table. Show method for all figures in column C.

A f...	B t...	C metho
2	2	8 $2+3*2$
3	3	11 $2+3*3$
4	5	17 $2+3*5$
5	10	32 $2+3*10$
6	15	47 $2+3*15$

A6 | 15

1.3 1.4 1.5 1.6 RAD AUTO REAL

Create a scatter plot of your data.



A Puzzle Pattern

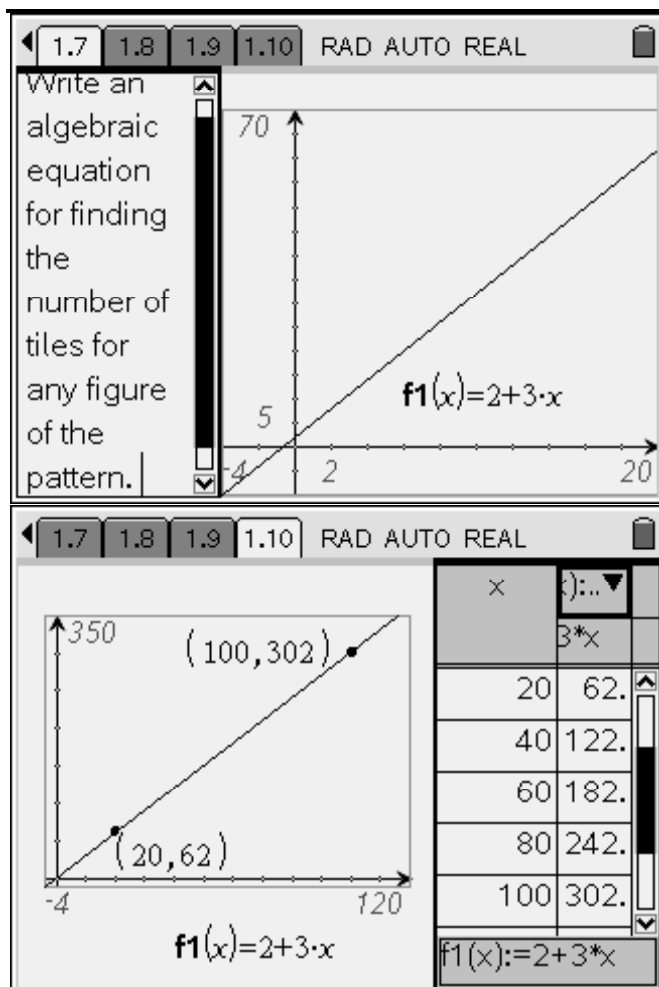
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Time required: 60 minutes

Materials: TI-Nspire



Activity extensions

Extension

Sketch figures 4 and 5. Circle the parts of each figure that represent the way you “see” the pattern. Record the equation (with the parts labeled) that will find the number of tile in each of these figures.

Use an unknown to write and then solve an equation to determine which figure would have 72 tiles.

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Subject: mathematics

Time required: 60 minutes

Materials: TI-Nspire



Figure 1

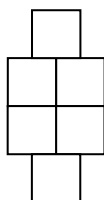


Figure 2

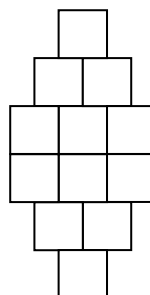
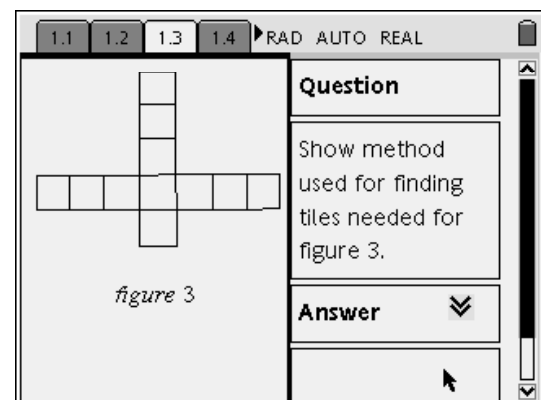
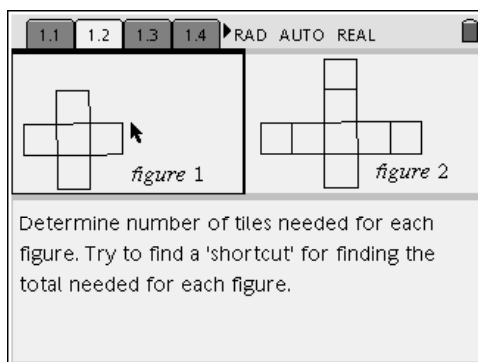
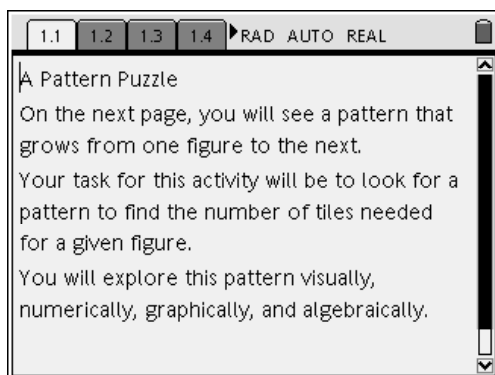


Figure 3

Student TI-Nspire Document

A_Pattern_Puzzle.tns



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Subject: mathematics

Time required: 60 minutes

Materials: TI-Nspire

1.1 1.2 1.3 1.4 RAD AUTO REAL

Create a table. Let Column A represent the figure number and column B represent the total number of tiles needed for that figure.

A figure	B tiles
1	1
2	2
3	3
4	
5	

A4 |

1.2 1.3 1.4 1.5 RAD AUTO REAL

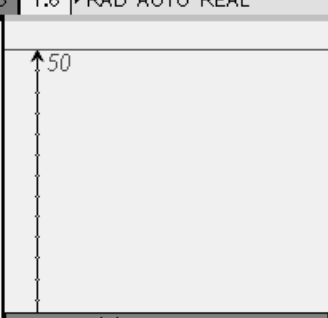
Determine number of tiles needed for the 5th, 10th, and 15th figures. Add values to table. Show method for all figures in column C.

A f...	B t...	C method
2	2	
3	3	
4	5	
5	10	
6	15	

C6 |

1.3 1.4 1.5 1.6 RAD AUTO REAL

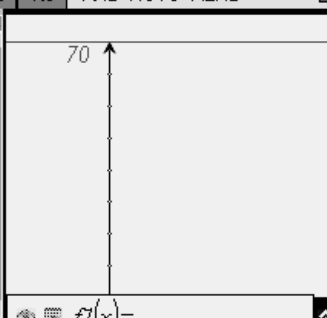
Create a scatter plot of your data.



$f1(x)=$

1.6 1.7 1.8 1.9 RAD AUTO REAL

Write an algebraic equation for finding the number of tiles for any figure of the pattern.



$f1(x)=$

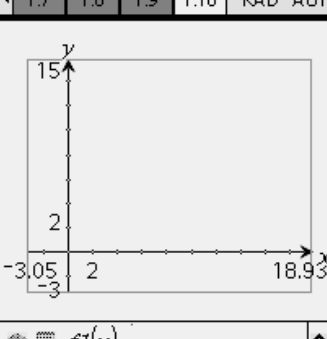
1.5 1.6 1.7 1.8 RAD AUTO REAL

On your paper, compare the equation, the scatter plot, the table, and the graph. What representation do you prefer for this situation? Explain.

1.6 1.7 1.8 1.9 RAD AUTO REAL

On the next page, use various representations to determine the number of tiles needed for the 20th figure? For the 100th figure?

1.7 1.8 1.9 1.10 RAD AUTO REAL



$f1(x)=$